Partnerships That Benefit the Laboratory and U.S. Industry

Since the Laboratory's beginning, many research and development activities have been executed in partnership with U.S. industry, academic institutions, and other laboratories. Partnerships and collaborations are often the most cost-effective way to accomplish the Laboratory's programmatic goals. In addition, Livermore has a responsibility to move breakthrough technologies developed in its mission-directed work into the marketplace, where the advances can positively affect the U.S. economy or other important national priorities.

EUV Lithography: A Partnership Defining Future Computers

Members of industry, government, and the news media gathered in April 2001 to mark completion of the first full-scale prototype lithography machine for making computer chips using extreme-ultraviolet (EUV) light. The technology, developed by Livermore, Sandia, and Berkeley national laboratories in collaboration with industry, is a breakthrough that will lead to microprocessors tens of times faster than today's most powerful chips and memory chips with similar increases in storage capacity.

Drawing on optical technology and precision engineering that supports its laser programs, the Laboratory brings to the project expertise in creating precision reflective optical coatings from multilayered materials, advanced optical testing methods, and defect inspection technologies. In the future, Livermore will directly benefit from the more powerful computers that will be made possible by EUV lithography.

The prototype EUV lithography machine, called the Engineering Test Stand, resides at Sandia California. It is being used by industrial partners and lithography tool suppliers to refine the technology and prepare to create a prototype commercial machine that meets industry requirements for high-volume chip production. Prior to the April ceremony, the Engineering Test Stand demonstrated the capability to produce minute images on silicon. EUV lithography promises to allow manufacturers to print circuit lines at least as narrow as 0.03 micrometer (1/3,000th the width of a human hair), which will extend the current pace of semiconductor innovation at least through the end of the decade. Processors built using EUV technology are expected to reach speeds exceeding 10 gigahertz in 2008; by comparison, the fastest Pentium®4 processor today runs at 2 gigahertz.

EUV lithography is being pursued by a unique industry–government collaboration that began in 1997. It involves the three DOE national laboratories and a consortium of semiconductor companies called the EUV Limited Liability Corporation (LLC). The consortium, which has committed $250 million to the project, includes Intel, Motorola, Advanced Micro Devices, Micron Technology, Infineon Technologies, and IBM. In October 2001, EUV LLC extended the cooperative research and development agreement (CRADA) to 2005.

1950s

In 1954, Livermore acquired its second computer, the IBM 701, 12 times faster than the Univac-1. But even more speed was needed, so the Laboratory issued a formal request for proposals to the computer industry. Subsequently, supercomputer design has been driven largely by the needs of scientific computing, with the national laboratories at the forefront.

1960s

As computers grew in capability, Livermore's demands on the machines grew more sophisticated. The CDC 6600 allowed multiple users of the machine, and the Laboratory developed the first practical time-sharing system. Demand also arose for better data management and storage hardware, including the trillion-bit IBM Photostore system, with its miniature film "chip" storage.

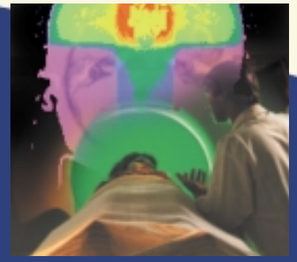
1970s

With the national energy crisis, the Laboratory became more engaged with U.S. industry in seeking innovations to increase energy supply and improve energy use. Livermore's special expertise and multidisciplinary approach have advanced technologies for exploration and retrieval of oil, gas, and coal; geothermal energy; fuel cells; and transportation systems.

1980s

A continuing technology transfer effort has characterized the Laboratory's development of progressively more powerful lasers—now NIF. Nova construction in the 1980s was a successful, long-term, major collaboration with U.S. industry that advanced the frontiers of laser technology and produced benefits far beyond initial expectations.

1990s



Through CRADAs and licensing, the Laboratory became engaged in a wide variety of projects with U.S. industry including health-care technologies such as the PEREGRINE system for cancer treatment and laser systems for various applications. Overall, researchers have won 85 R&D 100 Awards for technological achievements.